Express Mail No. EV904400989US

Attorney Docket No. 108298539US2
Disclosure No. 00-0448.02/US

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

IN RE APPLICATION OF:	MICHAEL J. JOSLYN	EXAMINER:	MAURINA T. RACHUBA
APPLICATION NO.:	10/828,427	ART UNIT:	3723
FILED:	APRIL 20, 2004	CONF. NO:	2796

FOR: **PLANARIZING MACHINES AND METHODS FOR DISPENSING PLANARIZING SOLUTIONS IN THE PROCESSING OF MICROELECTRONIC WORKPIECES**

Declaration of Michael J. Joslyn Under 37 C.F.R. § 1.131

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

I, Michael J. Joslyn, declare and state that:

1. I am the sole inventor of the invention described and claimed in U.S. Patent Application No. 10/828,427 filed on April 20, 2004, which is a Divisional Patent Application of U.S. Patent Application No. 09/939,430 filed on August 24, 2001. This declaration establishes invention in this country before April 3, 2001, and thus before the U.S. filing date of U.S. Patent Application No. 09/825,174 issued to Kunugi.

2. Before April 3, 2001, I conceived the invention currently presented in claims 7, 18, 20, 21, 52, 53, 56, 58, 60, and 61 of the above-captioned patent application. My conception of the invention is corroborated by (a) the signed and redacted pages of Micron Invention Disclosure No. 00-0448 (hereinafter the "00-0448 Disclosure" attached to this Declaration as Exhibit A), and (b) redacted notes taken by Paul T. Parker during an invention disclosure meeting held with me in Boise, Idaho (hereinafter the "00-0448 Meeting Notes" attached to this Declaration as Exhibit B).

3. As shown in the 00-0448 Disclosure and the 00-0448 Meeting Notes, I conceived of a planarizing machine. In one embodiment set forth in claim 7, the planarizing machine comprises a table having a support surface, a processing pad on the support surface, a carrier assembly having a head configured to hold a microelectronic workpiece, and a drive assembly carrying the head relative to the support surface. (The 00-0448 Disclosure, and the 00-0448 Meeting Notes at pages 3-5.) The planarizing machine further comprises a solution dispenser separate from the head. (The 00-0448 Disclosure, and the 00-0448 Meeting Notes at pages 3-5.) The solution dispenser is configured to discharge a planarizing solution onto a plurality of locations on the pad. (The 00-0448 Disclosure, and the 00-0448 Meeting Notes at pages 3-5.) The solution dispenser comprises an elongated support extending over the pad at a location spaced apart from a travel path of the head, a fluid passageway carried by the support through which a planarizing solution can flow, and a fluid discharge unit slidably carried by the support and in fluid communication with the fluid passageway. (The 00-0448 Disclosure, and the 00-0448 Meeting Notes at pages 3-5.) The fluid discharge unit is moveable along the support to discharge a flow of the planarizing solution onto separate areas of the processing pad during a planarizing cycle. (The 00-0448 Disclosure, and the 00-0448 Meeting Notes at pages 3-5.)

4. I also conceived of a further embodiment set forth in claim 56 in which the planarizing machine further comprises an actuator coupled to the fluid discharge unit and configured to move the fluid discharge unit along the support. (The 00-0448 Disclosure, and the 00-0448 Meeting Notes at pages 3-5.)

5. I also conceived of still another embodiment, set forth in claim 18, in which a planarizing machine comprises a planarizing machine that comprises a table having a support surface, a processing pad on the support surface, a carrier assembly having a head configured to hold a microelectronic workpiece, and a drive assembly carrying the head. (The 00-0448 Disclosure, and the 00-0448 Meeting Notes at pages 3-5.) The planarizing machine further comprises a solution dispenser separate from the head. (The 00-0448 Disclosure, and the 00-0448 Meeting Notes at pages 3-5.) The solution dispenser has a support extending over the pad and a distributor carried by the support.

(The 00-0448 Disclosure, and the 00-0448 Meeting Notes at pages 3-5.) The distributor is configured to discharge a planarizing solution from a plurality of locations along the support. (The 00-0448 Disclosure, and the 00-0448 Meeting Notes at pages 3-5.) The support comprises an elongated arm and a fluid passageway carried by the arm through which a planarizing solution can flow. (The 00-0448 Disclosure, and the 00-0448 Meeting Notes at pages 3-5.) The distributor further comprises a fluid discharge unit slidably carried by the arm and in fluid communication with the fluid passageway. (The 00-0448 Disclosure, and the 00-0448 Meeting Notes at pages 3-5.) The fluid discharge unit is moveable along the arm to discharge a flow of the planarizing solution along different areas of the processing pad during a planarizing cycle. (The 00-0448 Disclosure, and the 00-0448 Meeting Notes at pages 3-5.)

6. I also conceived of a further embodiment set forth in claim 58 in which the planarizing machine further comprises an actuator coupled to the fluid discharge unit and configured to move the fluid discharge unit along the arm. (The 00-0448 Disclosure, and the 00-0448 Meeting Notes at pages 3-5.)

7. I also conceived of still another embodiment, set forth in claim 20, in which a planarizing machine comprises a planarizing machine that comprises a table having a support surface, a processing pad on the support surface, a carrier assembly having a head configured to hold a microelectronic workpiece, and a drive assembly carrying the head. (The 00-0448 Disclosure, and the 00-0448 Meeting Notes at pages 3-5.) The planarizing machine further includes a solution dispenser that has a support above the pad and a nozzle moveably coupled to the support so that the nozzle is movable during a planarizing cycle. (The 00-0448 Disclosure, and the 00-0448 Meeting Notes at pages 3-5.) The nozzle is coupleable to a planarizing solution. (The 00-0448 Disclosure, and the 00-0448 Meeting Notes at pages 3-5.)

8. I also conceived of a further embodiment in which the planarizing machine further comprises an actuator coupled to the nozzle and configured to move the nozzle relative to the support, as set forth in claim 60. (The 00-0448 Disclosure, and the 00-0448 Meeting Notes at pages 3-5.) I also conceived a still further embodiment wherein the support comprises an elongated arm and a fluid passageway carried by the arm

through which a planarizing solution can flow, and wherein the nozzle is slidably carried by the arm and in fluid communication with the fluid passageway, as set forth in claim 21. (The 00-0448 Disclosure, and the 00-0448 Meeting Notes at pages 3-5.)

9. I also conceived of yet other embodiments, directed toward methods of processing a microelectronic workpiece. For example, in one embodiment set forth in claim 52, a method of processing a microelectronic workpiece comprises removing material from the workpiece by pressing the workpiece against a contact surface of a processing pad and imparting relative motion between the workpiece and the contact surface. (The 00-0448 Disclosure, and the 00-0448 Meeting Notes at pages 3-5.) The method further comprises discharging a planarizing solution directly onto a first region of the contact surface and concurrently discharging the planarizing solution directly onto a second region of the contact surface separate from the first region. (The 00-0448 Disclosure, and the 00-0448 Meeting Notes at pages 3-5.) The planarizing solution is deposited onto the first and second regions separate from a head carrying the workpiece. (The 00-0448 Disclosure, and the 00-0448 Meeting Notes at pages 3-5.) Discharging the planarizing solution comprises (a) passing the planarizing solution through a fluid discharge unit that is moveably carried by a support over the processing pad and (b) concurrently moving the fluid discharge unit relative to the support to discharge the planarizing fluid at different regions across the contact surface while removing material from the workpiece. (The 00-0448 Disclosure, and the 00-0448 Meeting Notes at pages 3-5.) The fluid discharge unit includes a nozzle. (The 00-0448 Disclosure, and the 00-0448 Meeting Notes at pages 3-5.)

10. I also conceived of a further embodiment wherein moving the fluid discharge unit comprises sliding the fluid discharge unit along the support, as set forth in claim 53. (The 00-0448 Disclosure, and the 00-0448 Meeting Notes at pages 3-5.) I also conceived of a further embodiment wherein concurrently moving the fluid discharge unit includes moving the fluid discharge unit relative to the support with an actuator, as set forth in claim 61. (The 00-0448 Disclosure, and the 00-0448 Meeting Notes at pages 3-5.)

11. After conceiving this invention, I proceeded diligently by preparing the 00-0448 Disclosure with my employer, working through an invention review procedure, participating in a conference with Paul T. Parker, and participating in other aspects of preparing the present application. On August 24, 2001, I constructively reduced this invention to practice with the filing of the parent application (U.S. Patent Application No. 09/939,430).

12. I further declare that all statements herein made of my own knowledge are true, and that all statements made on information or belief are believed to be true; and further, that the statements are made with the knowledge that the making of willful or false statements or the like is punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and may jeopardize the validity of any patent issuing from this application.

Dated this 6 day of September, 2006.

Respectfully submitted,

Michael J. Joslyn

INVENTION DISCLOSURE

00-0448

1. **INVENTOR(S):**

   Michael J Joslyn 21

2. **DESCRIPTION:**

   - **Title:**

     Slurry dispense method to pad

   - **Brief Description:**

     Most conventional CMP tools dispense slurry to a point location. This invention would use a manifold to dispense slurry to a greater surface area than one dispense point. An oscillating slurry dispense tube is also possible. This could improve uniformity, process stability, and reduce slurry consumption.

3. **CONCEPTION & DOCUMENTATION OF INVENTION:**

   - **Date when first conceived:**

     [redacted]

   - **To whom was the idea first described:**

     Dinesh Chopra

   - **On what date:**

     [redacted]

   - **Date of the first tangible record:**

     [redacted]

   - **Type and location:**

     Email to Dchopra in Outlook dated [redacted]

4. **INFORMATION RELATED TO INVENTION:**

   - **Related invention disclosures:**

     None known

   - **Closest technology:**

     None known

- **Advantages of this invention over previous technology:**

  Slurry usage could be reduced, uniformity could be improved.

5. **IMPORTANT DATES:**

   - **If the invention has been disclosed outside the company, please specify to whom it has been disclosed, when, and in what form:**

     N/A

   - **If any articles describing your invention have been published, please specify the author(s), title of article, publication and date:**

     N/A

   - **If any engineering samples have been given out, please specify to whom and on what date they were given:**

     N/A

   - **If any product using the invention has been sold or offered for sale, please specify to whom and on what date:**

     N/A

6. **DISPOSITION OF THE INVENTION:**

   - **When will (or did) Micron begin use of the invention experimentally:**

     Plans to use a manifold dispense system are underway as of [redacted]

   - **When will (or did) Micron begin production of this invention:**

     When proved worthy and qual'd for production.

7. **MISCELLANEOUS INFORMATION:**

   - **ARPA project:**

   - **Was the invention developed during a joint development agreement or other contract with an outside company:**

     NO

   - **List developmental work outside of the company, including Government proposal or contract:**

     N/A

8. **INVENTORS:**

   - _____

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Home Address : 1016 N.21st St.
City : Boise **State** : ID **Zipcode** : 83702
Citizenship : U.S.
Company : Micron Technology, Inc.
Work Phone # : 368-5527 **Mail Stop** : 306
Dept Name : Fab 4 CMP/PVD **Dept #** : 415
Supervisor : Jason Elledge

Signature : Michael J. Joslyn **Date** : [redacted]

9. WITNESS:

If there is only one (1) inventor, a witness should sign and date this disclosure. A witness in this case is a non-inventor who understands the nature of the invention.

[redacted] [redacted]

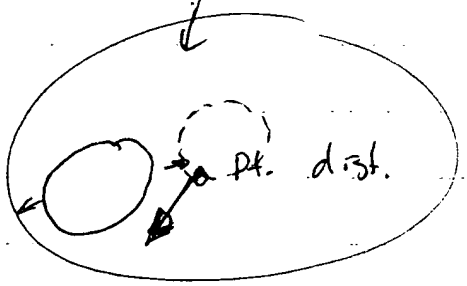
(Signature of Witness) (Date)

Disclosure Meeting
Mike Joslyn
* works nights

CMP – Goals
(a) more uniform slurry distribution
(b) r

Prior Art –
· Generally thought to use more slurry to achieve better uniformity. – Cu slurries & metal ~~slurries~~ slurries.

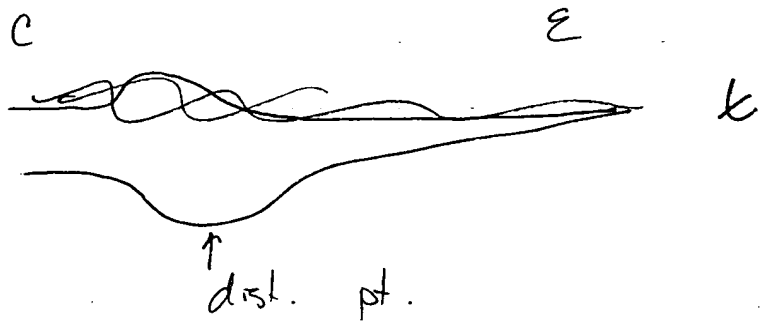
Problems – Using a pt. distribution on new ~~or~~ CMP Machines causes
(a) poor distribution – Mirra & others have a small platen/pad almost size of head.



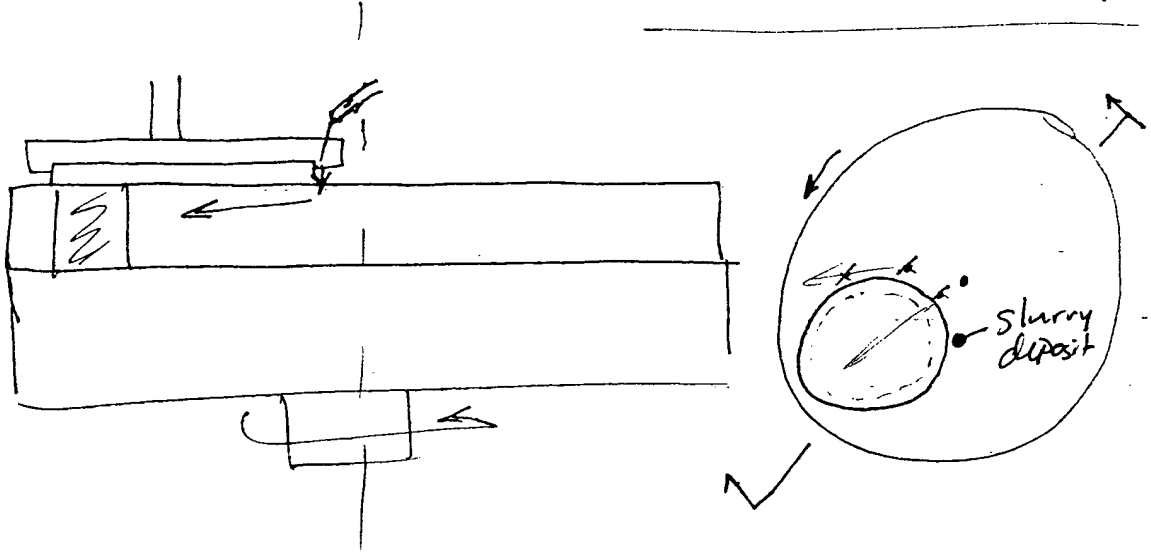
Centrifugal force may cause center area to have less p. – sol.

(b) pH is low in wbal CMP (pH is similar to pad cleaning), so then P-sol also cleans pad during cycle. Since center does not see much P-sol, get uneven P-surface on pad. ⇝ "staining" on pad is removed ~~toward~~ outside of pt. deposit.
⇝ creates ~~un~~ non-uniformity problems.

(c) Heat capacity ~~of~~ across pad varies because of single ~~pt~~ point. P. sol is cool compared to ~~the~~ friction on pad.



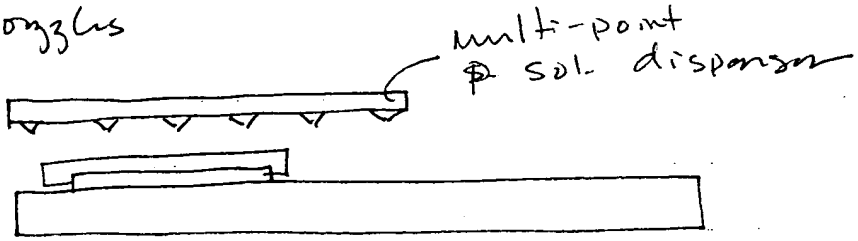
Mitra AMAT

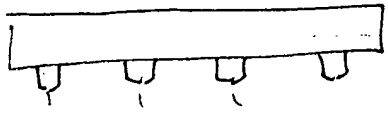


Art- Multi-point rinse

Solution - Control slurry dispense across multiple points of the pad.

Embodiments
- overflow wier
- ~~P~~. nozzles



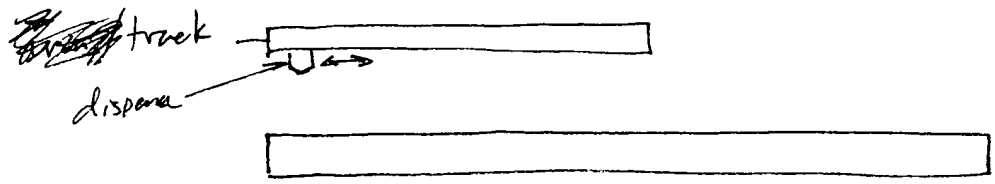
- nozzles   - Concern is clogging

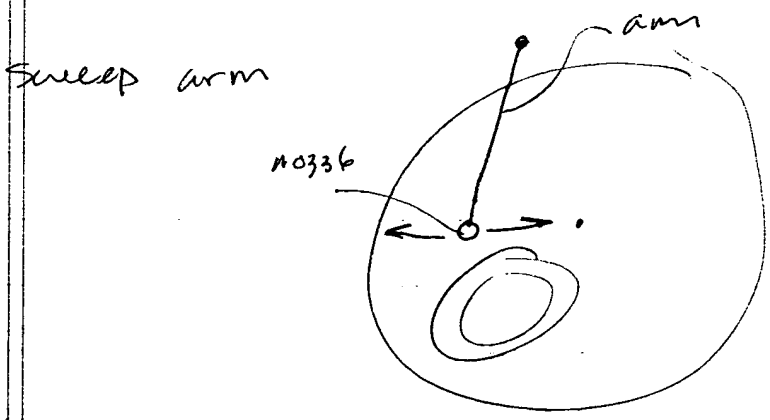
- wier  - concern is settling & abrasives & cleaning

- individual nozzles - each has a controllable flow rate

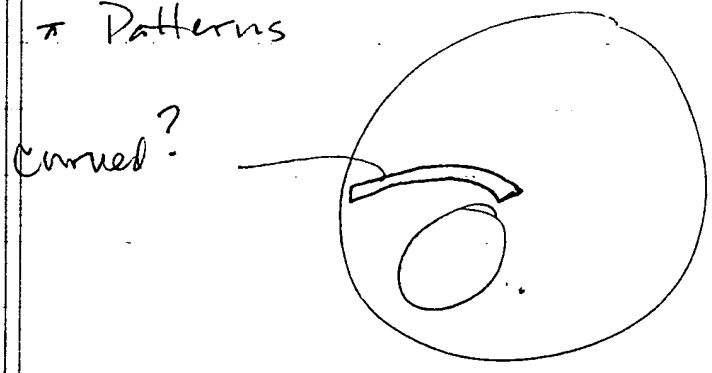
- segmented wier - each segment has a controllable flow rate

* Oscillating multipt & single-pt





* Patterns



Control P-Sol Flow Rate in Real Time –

A.) Measure a parameter of planarizing cycle
- temp > distribution across pad
- pressure > "
- reflectance > area on wafer

e.g. – Hot area or high-pressure area → compensate slurry flow.
- more to high temp area, or less to low temp.

e.g. – Sense (by reflectance) edge is too fast, → reduce edge dispense

B. Change dispense based upon previous polish performance.
e.g.– if center typically polishes faster, then increase

C. Through pad dispense → IPEC
w/ dispense zones

Advantages -

(A) More uniform in-situ cleaning during the planarizing cycle.
- result in better uniformity

(B) Better distribution

(C) Mitigating heat gradient across pad.
- More uniform chem. reaction.

(D) Reduce slurry consumption

(E) Provide more control of process parameters